

## INTRODUCTION

The U.S. Geological Survey (USGS) and the Massachusetts Department of Environmental Management, Office of Water Resources (MDEM) have a long history of working together to provide water-resources information to the citizens of Massachusetts. The USGS is the Nation's primary agency for water-resources research and data collection. The MDEM is the State's primary water-resources planning agency, and is charged with developing water-management plans for each of the 27 planning basins of Massachusetts. The two agencies work together through cooperative agreements to share research costs.

In the 1960's, the USGS and the MDEM began a series of studies to assess and map the major aquifers in each of the State's planning basins. Reports for this series of studies were completed in 1990. In the 1980's, the USGS and the MDEM began a new series of detailed ground-water appraisals, aquifer assessments, and related hydrology studies that were

authorized by the Chapter 800 Act of 1979 of the Massachusetts legislature; these are known as Basin Hydrology Studies. The agencies also are cooperating in two additional series of studies—Basin Yield Studies, to determine the availability of water in the State's rivers during periods of low flow; and Water-Use Studies, which document water use in Massachusetts.

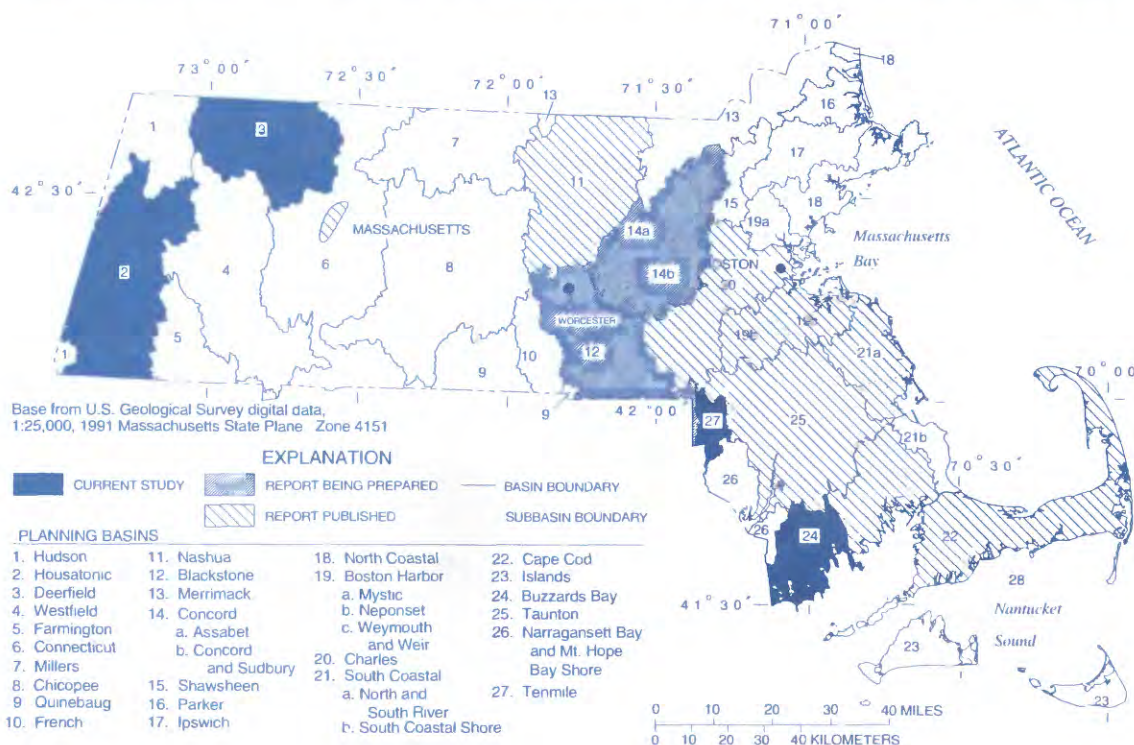
Information from the studies is used by the MDEM to prepare their water-management plans. This information also is used by communities to help locate potential sources of water supply and to design wastewater-treatment facilities, by other State agencies to assess the effects of water withdrawals and interbasin water transfers, and by environmental groups to design resource-protection areas.

## BASIN HYDROLOGY STUDIES

Basin Hydrology Studies describe the hydrology and water resources of each of the State's planning basins. Although

approaches have differed according to the unique characteristics of each basin, reports for each study have included information on streamflow in the basin and on the location, boundaries, and water-bearing properties of the aquifers and surrounding upland areas. The studies also have included research on aquifer recharge, water use, water quality, suspended-sediment discharge of streams, induced infiltration of streamflow to water-supply wells, and stream-aquifer interactions. Some of the studies have included mathematical models of major streams and aquifers that can be used to evaluate resource-management alternatives. Reports for seven Basin Hydrology Studies have been published by the USGS to date. Current studies in four basins are described as follows:

• **Buzzards Bay Basin Study:** The Buzzards Bay Basin is in southeastern Massachusetts. Several rivers discharge water from the 374-square-mile basin into Buzzards Bay and Rhode Island Sound. Because some towns in the basin



Planning basin boundaries and status of basin hydrology studies in Massachusetts, 1995.



experienced water shortages during the mid-1960's and early 1980's, they may need to develop additional ground-water supplies to meet demands during any future droughts. This study, which began in April 1991, will help towns to determine potential areas for new ground-water supplies by refining the boundaries and water-bearing properties of aquifers in the basin, estimating ground-water discharges to streams at times of low flow, and evaluating stream-aquifer interactions.

- **Deerfield River Basin Study:** The Deerfield River, which is a tributary of the Connecticut River, drains 348 mi<sup>2</sup> of northwestern Massachusetts. The river is important for hydroelectric-power generation and for recreational uses, such as fishing and whitewater rafting and canoeing. Federal drinking-water regulations, which were recently made more strict, could cause some towns in the upper basin to consider replacing surface-water supplies with ground-water supplies. A potential ground-water source could be small aquifers in the narrow river valleys in the upper basin. This study, which began in October 1992, will refine boundaries and water-bearing properties of aquifers in the basin, estimate recharge to the aquifers from surrounding mountainous upland areas, estimate ground-water discharge to streams at times of low flow, and compare changes in ground-water levels adjacent to the Deerfield River to changes in river levels caused by upstream dams.

- **Housatonic River Basin Study:** The Housatonic River drains about 504 mi<sup>2</sup> of southwestern Massachusetts. Nearly all water used in the basin by municipalities and industries is from reservoirs on tributary streams. To meet possible increased demand and stricter Federal drinking-water regulations, ground-water sources may need to be developed. The amount of suspended sediment carried by the Housatonic River into Connecticut also is a concern because the river is one of the highest sediment-producing rivers in the State. This study, which began in December 1993, will aid State and local planners by providing estimates of aquifer recharge and ground-water discharge to streams in

the basin at times of low flow, as well as the amount of suspended sediment carried into Connecticut.

- **Tenmile River Basin Study:** The Tenmile River drains 49 mi<sup>2</sup> of southeastern Massachusetts. Four principal aquifers supply most of the water used in this densely populated basin. This study, which began in January 1993, will determine the boundaries and water-bearing properties of the aquifers, ground-water discharge to streams during times of low flow, recharge to the aquifers and surrounding upland areas, and stream-aquifer interactions in the basin.

## BASIN YIELD STUDIES

For planning purposes, the MDEM may need to estimate the availability of water during low-flow periods for sites on any stream in the State. This information is most critical where new water-resource uses are being or will be considered. Streamflow data needed to obtain this information are available for few sites.

Estimates of streamflow availability during low-flow periods at ungaged stream sites have been provided in reports for two Basin Yield Studies. A third Basin Yield Study began in 1993. The studies have used two approaches. The first approach has been to collect the necessary data at more than 150 sites by measuring streamflows during low-flow periods. The second approach has been to use statistical analyses to develop equations that relate low-flow statistics for any site to physical characteristics of its drainage area.

The first Basin Yield Study began in 1988, and a report was published in 1993. The second study began in 1989, and a report was published in 1994. These two reports provide low-flow estimates for more than 100 sites in eastern Massachusetts and equations that can be used to estimate low-flow statistics for other sites. Equations developed for the second study are more widely applicable than those developed for the first study. Equations developed for the third Basin Yield Study will be more widely applicable than those

from the previous studies. Equations for estimating additional low-flow statistics also will be developed, and a geographic information system will be used to automate the estimating process.

## WATER-USE STUDIES

The Water-Use Studies collect, analyze, store, and provide information on the withdrawal, distribution, use, and return of water by municipal, agricultural, commercial, and industrial water suppliers and users in the State. These studies are done through a cooperative agreement among the USGS, the MDEM, and the Massachusetts Department of Environmental Protection. Water-use information is used by public and private water policymakers, planners, managers, and users, as well as in other hydrologic investigations.

Water-use data includes: the location, amount, user, and purpose of the water withdrawal; consumption rates; and the amount and location of water returned after use. Data are collected from Federal, State, and local sources, and are stored in the New England Water Use Data Storage and Retrieval System (NEWUDS) data base that is maintained by the USGS. Water-use data are available for analysis through NEWUDS. Several interpretive reports for this study have been published.

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Information on technical reports and hydrologic data related to the USGS–MDEM cooperative program can be obtained from:

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